Remarks

The Applicants have amended Claims 1-16 to recite a "ferritic" stainless steel. Support may be found throughout the Applicants' Specification such as in the last two lines of page 10. Claims 1 and 2 have also been amended to include the amount of Al from Claim 3. Claim 3 has been reworded to account for that change. Claims 1 and 2 have further been amended to have a contact resistance of 10 $m\Omega \cdot cm^2$ or lower. Support may be found in the Applicants' Specification on page 14, lines 15-18, for example.

Claims 17-31 have been cancelled to facilitate early allowance. The Applicants specifically reserve the right to file one or more divisional applications directed to the subject matter of those claims. Finally, the Applicants have amended Claims 13, 14 and 16 so that the Cr ranges are now lower than in the independent claims. Direct support may be found on page 16, line 58 in the Applicants' Specification.

The Applicants respectfully request that the above amendments, cancellations and additions be entered into the official file and considered on the merits. The Applicants note that the changes to Claims 1-16 do not raise new issues inasmuch as the changes made directly in response to the Examiner's helpful comments in the last rejection. Further, cancellation of Claims 17-31 removes further issues, thereby facilitating allowance.

The Oath or Declaration is said to be defective because it does not identify the citizenship of each inventor. The Applicants enclose a copy of the Declaration submitted on July 22, 2009 for the Examiner's convenience. Reference to page 3 of that Declaration shows that all five inventors are identified by their Japanese citizenship. Withdrawal of the objection is respectfully requested.

Claims 1-5 and 7-16 stand rejected under 35 USC §103 over US 2002/0160248. As previously noted, that publication has now issued as US 6,835,487 and all comments will be directed to that issued patent as Takao. The Applicants note with appreciation the Examiner's detailed comments hypothetically applying Takao against those claims. The Applicants nonetheless respectfully submit that Takao fails to provide disclosure, teachings or suggestions that would lead one skilled in the art to the subject matter of Claims 1-5 and 7-16. Reasons are set forth below.

The Applicants first note that Takao employs aqua regia or an acid mixture to adjust surface roughness. Thus, the objective of Takao is to remove portions of the surface or the film on the surface to create a surface roughness within a specified profile. This is sharply contrasted to the Applicants' objective of causing the passive film on the surface of the stainless steel to have a particular compositional content. Surface roughness is not what the Applicants seek to change or adjust as is the case with Takao.

The Applicants discovered that it is the actual composition of the passive film that effects electrical conductivity and they do not particularly care about the surface roughness. The Applicants therefore respectfully submit that one skilled in the art would have no incentive to look to Takao for teachings that would allow one skilled in the art to change the composition of the passive film (as opposed to removing portions of the film itself) to facilitate electrical conductivity. There are no discussions in Takao that would enable one skilled in the art to do so. In other words, there is nothing in Takao that teaches one skilled in the art how to change the composition of the passive film (as opposed to removing portions of the passive film). The Applicants therefore respectfully submit that one skilled in the art would not look to Takao.

In any event, Takao takes a different approach to removing portions of the surface of the Takao steel sheets to change the surface roughness. The Applicants have already discussed the use of aqua regia by Takao and have already discussed that the Applicants employ a different way to change the composition of the passive film (as opposed to removing portions of the passive film) and that the manner in which the Applicants do so is different from the utilization of aqua regia.

The rejection states that the Examiner "disagrees with Applicant's description of aqua regia." This is not understood. The Applicants have taken the common, well-accepted definition of aqua regia in the Applicants' previous Response and enclose supplemental materials factually confirming that the Applicants' description was, in fact, correct. In that regard, the Applicants enclose a copy of a definition taken from the "free online dictionary," another definition taken from "experience festival.com," yet another definition from "Wikipedia," and finally, a definition taken from *Hackh's Chemical Dictionary*. Those definitions refer to a nitric-acid hydrochloric acid mixture taken at a volumetric ratio of 1:3, respectively. In other words, they confirm the Applicants' prior description of aqua regia.

The rejection also erroneously requires that the Applicants show "proof" that the treatment of Takao would not have resulted in a similarly enriched passive layer. This is not required under the rules. This rejection is based on inherency. It is based on the supposition that the compositions of the Takao steels overlap with the compositions of the Applicants' claimed steels and that treatment by aqua regia as taught by Takao would inherently result in a passive layer that has the same characteristics.

Before addressing the specifics of this point, the Applicants note that the physical characteristics of steels and their various coatings are indeed influenced by their compositions.

However, the physical characteristics are also influenced by the methods in which those steels or their coatings are made. Thus, an overlap in composition does not necessarily mean that the physical characteristics will be the same if the methods of making those steels or coatings are different. Conversely, similar methods apply to making steels or coatings will not necessarily result in the same physical characteristics if the compositions are different.

In this instance, assuming *arguendo*, an overlap in initial composition, the Applicants have already demonstrated that they employ a different methodology. This is because their objective is different from Takao as noted above. The Takao objective is to remove portions of the passive film and/or surface of the steel to impact the surface roughness. That is not the Applicants' objective. The Applicants objective is to change the composition of the passive film itself to improve electrical conductivity.

Under such an inherency rejection, the MPEP requires that the rejection demonstrate that the claimed physical characteristic would "necessarily" be present. It is not enough that the physical characteristic might be present, could be present or is even likely present. It must be demonstrated to be "necessarily" present. The Applicants respectfully submit that the rejection does not meet this initial burden. Again, assuming *arguendo* overlap in the initial composition ratios, the Applicants have demonstrated that they employ a different treatment method than Takao. Takao employs aqua regia with a specified, well-known composition as factually demonstrated herein and the Applicants employ a different treatment regimen. They employ this different regimen because their objectives are different.

The Applicants have also factually demonstrated that differences in the treatment regimen can and do result in different characteristics. In that regard, the Applicants invite the Examiner's attention to Tables 3 and 4 in the Applicants' Specification which have a number of

inventive and comparative examples wherein identical steels are subjected to the Applicants' treatment regimen versus several types of pickling regimens. It can be seen that utilization of different treatment regimens result in different physical characteristics. It logically flows that utilization of aqua regia as taught by Takao will result in still different physical characteristics.

The Applicants' Specification does not employ aqua regia as a comparative regimen. However, that it not needed. It is the initial burden of the Patent Office to demonstrate that the physical characteristics would "necessarily" be the same. The Applicants have, however, factually demonstrated that utilizing different treatment regimens results in different physical characteristics. Thus, the Applicants have factually demonstrated that utilizing an aqua regia treatment very well could result in a different set of physical characteristics. That is all that the Applicants need to do since the burden of establishing that the physical characteristics are "necessarily" present is on the Patent Office, not on the Applicants. The Applicants respectfully submit that the initial burden has not been met as a result of the Applicants' establishment that different treatment regimens result in different physical characteristics. In any event, because the manufacturing methods (pickling conditions) are different between the Applicants' approach and that of Takao, the composition of the passive films is different.

Pertaining to the Applicants' treatment of adjusting the composition of the passive film, the Applicants' Specification on page 22 at lines 6 to 1 from the page bottom states:

> "For enhancing both the corrosion resistance and electrical conductivity, however, a solution totally different from a solution used in ordinary pickling should be used to adjust Cr content, Fe content, A1 content, and binding state of O (oxygen) of the passive film."

For example, as described in the Applicants' Specification on page 23 at lines 4 to 9 on the subject of a favorable manufacturing method, "the Cr/Fe atomic ratio was increased and O(M) /

O(H) was decreased and favorable results could be gained when an acidic solution having a 2-10 times higher concentration of hydrochloric with respect to the concentration of nitric acid was used."

In sharp contrast, in Takao, the descriptions of Experiment 2 and Example 2 explain "pickled with aqua regia (mixture of 1:3 nitric acid/hydrochloric acid)". In general, (and also with Takao), aqua regia is prepared by mixing commercially available concentrated nitric acid (about 70 mass %) and concentrated hydrochloric acid (about 35% mass%) by a volume ratio of 1:3 and the mixed liquid comprises nitric acid: 70 mass % x 1/4 = 17.5 mass % and hydrochloric acid: 35 mass % x 3/4 = 26.25 mass% and therein the concentration of the hydrochloric acid to the nitric acid is 26.25/17.5 = 1.5, which is less than twice and the liquid is different in terms of the composition of the Applicants' acid solution.

Consequently, the Applicants respectfully submit that because the acid solution for use in the treatment of adjusting the composition of the passive film is dissimilar to the acid solution disclosed in Takao, the stainless steel for separators produced by the manufacturing method specified in Claims 1 to 16 is different from the stainless steel for separators taught by Takao.

The rejection states that if the same treatment (nitric acid and hydrochloric acid) is applied to a raw material having almost the same composition, the product should be the same. Nevertheless, pertaining to the contact resistance disclosed in Takao, therein Claim 1 of Takao specifies $100 m\Omega \cdot cm^2$ or lower and $40\text{-}87\ m\Omega \cdot cm^2$ is disclosed in a Table of Examples in Takao. When compared with the contact resistance of Takao, the contact resistance of Claims 1 and 2 is substantially lower ($10\ m\Omega \cdot cm^2$ or lower) and the contact resistance drastically changes by the composition (composition ratio) of acid even when the type and combination of the acid to be used for the passivation treatment are the same.

Also, the rejection states on page 11 that "the Examiner disagrees with Applicants' description of aqua regia." Nevertheless, rigorous calculation demonstrates that the specific gravity of concentrated nitric acid (about 70 mass%) and concentrated hydrochloric acid (about 35 mass%) is 1.18 and 1.42, respectively, when nitric acid and hydrochloric acid are mixed by a "volume ratio" of 1:3, the mixed liquid comprises with more exact values of nitric acid: 1.42 x 70% / (1.42 + 1.18 x 3) = 20% and hydrochloric acid: 1.18 x 3 x 35% (1.42 + 1.18 x 3) = 25%. At any rate, the concentration of hydrochloric acid to nitric acid is less than twice and this is outside the Applicants' range. Withdrawal of the rejection is respectfully requested.

The Applicants will now address the double-patenting rejection inasmuch as it is directed to US 6,835,487, which is the above-discussed Takao publication. The Applicants have already established that Takao is not inherently and/or *prima facie* obviousness over Takao with respect to the rejection under §103. In other words, the Applicants have already established that Claims 1-5 and 7-16 are patentably distinct over Takao. They are therefore patentably distinct over Claims 1-30 of Takao as recited in the double-patenting rejection. Withdrawal of the rejection is respectfully requested.

Claims 1-5 and 7-16 stand rejected under 35 USC §103 over Hodgson. The Applicants again note with appreciation the Examiner's detailed comments hypothetically applying Hodgson. However, the Applicants respectfully submit that Hodgson is inapplicable to those claims. As noted in the last Response, Hodgson is directed toward austenitic stainless steels, while the Applicants' stainless steels are ferritic stainless steels. The Applicants have accordingly amended those claims to recite that the claimed stainless steel is a "ferritic" stainless steel. As such, even if one skilled in the art were to make the hypothetical changes as recited in

the rejection, the resulting steel would still be austenitic, as opposed to the Applicants' claimed ferritic steels. Withdrawal of the rejection on this basis alone is respectfully requested.

The Applicants respectfully submit that Hodgson would in any event result in different steels because of the different methodology used to make the steels. The Applicants note that the rejection states that "the method used to create the steel is not what is claimed" and instead note that it is "the steel itself is what is claimed." The Applicants agree that they are not claiming the method. They are claiming the steel. However, as noted above with respect to Takao, mere overlap of the composition does not necessarily mean that the physical characteristics will be the same. Those skilled in this art are well aware that the methods of making the steels can and does seriously impact the physical characteristics. Thus, the Applicants have pointed out in the previous Response that the methodology is different to demonstrate that the different physical characteristics of the claimed steel itself will likely be different, as opposed to be "necessarily" (inherently) the same.

In other words, Hodgson utilizes an anodic treatment regimen which is different from the Applicants' treatment regimen as disclosed in their Specification. The Applicants have already factually demonstrated that utilizing different treatment regimens does result in different physical characteristics as shown in their Tables 3 and 4. As a consequence, one skilled in the art would have a reasonable expectation that utilizing the Hodgson anodic treatment would likely have an impact on the Hodgson steels and that the resulting characteristics at the very least could be quite different. Thus, the Applicants have established that the physical characteristics are not "necessarily" the same. This means that the Patent Office has not met its burden in establishing inherency under MPEP §2112. Also, the rejection states on page 5 that "Hodgson teaches fuel cell separators which are made by a surface treatment (see Abstract, pp. 1-3). Hodgson teaches

that the treatment comprises a pickling in acid, which may include a combination of acids including sulfuric and nitric acids." However, the Hodgson treatments are entirely electrolytic treatments. For example, the claims of Hodgson recite "the method includes treating with an electrical current while contacted by an electrolyte." Further, the best result is obtained when an electrolytic treatment is performed by using sulfuric acid under certain conditions (wherein, the results of using other electrolyte are included).

In sharp contrast, the contact resistance is decreased by a treatment of immersion into acid according to the Applicants' Claims 1 and 2. In the case of ordinary pickling also, the type and combination of acids to be chosen vary depending on whether electrolytic method or soaking method. Hence, the results of Hodgson do not provide even a hint to select the Applicants' treatment method.

In addition, the rejection in the final paragraph on page 13 of the Office Action states "claim of (Al/(Fe+Cr) < 0.1) is satisfied if A1 is not included." On this point, Claims 1 and 2 specify as an indispensable element, A1. Withdrawal of the rejection is respectfully requested.

In light of the foregoing, the Applicants respectfully submit that the entire Application is now in condition for allowance, which is respectfully requested.

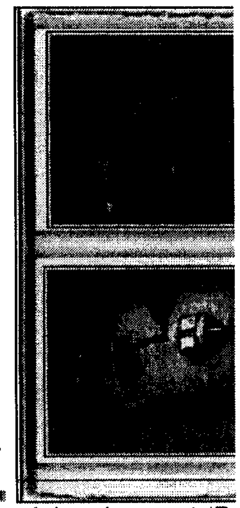
Respectfully submitted,

T. Daniel Christenbury
Reg. No. 31,750
Attorney for Applicants

TDC/vp
(215) 656-3381

aqua regia

Also found in: Acronyms, Encyclopedia, Wikipedia, Hutchinson 0.01 sec.



aqua re·gi·a (rē'jē-ə, rē'jə)
n.

A corrosive, fuming, volatile mixture of hydrochloric and nitric acids, used for testing metals and dissolving platinum and gold. Also called *nitrohydrochloric acid.*

[New Latin aqua rēgia : Latin aqua, *water* + Latin rēgia, feminine of rēgius, *royal (because it dissolves gold, the "royal metal").*]

aqua regia [□ri : d□□ə]
n

(Chemistry / Elements & Compounds) a yellow fuming corrosive mixture of one part nitric acid and three to four parts hydrochloric acid, used in metallurgy for dissolving metals, including gold Also called **nitrohydrochloric acid**

[from New Latin: royal water; referring to its use in dissolving gold, the royal metal]

aqua regia (rē'jē-ə, rē'jə)

A corrosive, fuming, volatile mixture of hydrochloric and nitric acids. Aqua regia is used for testing metals and dissolving platinum and gold.

Thesaurus

Legend: Synonyms | Related Words | Antonyms

Noun 1. aqua regia - a yellow fuming corrosive mixture of nitric and hydrochloric acid that dissolves metals (including gold)

nitrohydrochloric acid

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ARTICLES RELATED TO aqua regia

aqua regia: Encyclopedia - Aqua regia
Aqua regia (Latin for "royal water") is a highly corrosive, fuming yellow liquid, formed b mixture of concentrated nitric acid (otherwise known as aqua fortis) and concentrated h acid, usually in the ratio of one to three. It is one of the few reagents able to dissolve g platinum. It was so named because it can dissolve the so-called royal, or noble metals, tantalum, iridium, and a few other extremely passive metals are able to withstand it. A used in etching and in certain analytic procedures. Aqua regia does not last very long; .

Including:

- Aqua regia - How it works
- Aqua regia - History

Read more here: » Aqua regia: Encyclopedia - Aqua regia

aqua regia: Encyclopedia - Aqua vitae Aqua vitae (L. "water of life"), is an archaic r concentrated aqueous solution of ethanol. Not to be confused with the beverage aquavit, aqua vitae was typically prepared by distilling wine, and was sometimes known as Spirit of Wine in English-language texts. The name was familiarly applied to the leading native distilled spirits of a region. Thus, it was "usquebaugh" or whisky in Scotland and Ireland, "geneva" or gin in Holland; and "eau de vie" (Fr. "water of life") or brandy in France. When the term is employe ...
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aqua regia: Encyclopedia II - Aqua regia - How it works

Aqua regia

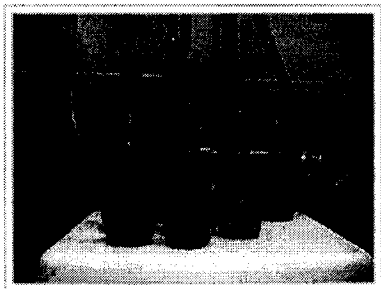
From Wikipedia, the free encyclopedia

Aqua regia or **aqua regis** (Latin for **royal water** or **king's water**) is a highly corrosive, fuming yellow or red solution, also called **nitro-hydrochloric acid.** The mixture is formed by freshly mixing concentrated nitric acid and concentrated hydrochloric acid, usually in a volumetric ratio of 1:3 respectively. It was so named because it can dissolve the so-called "royal metals," or noble metals, gold and platinum. However, tantalum, iridium, osmium, titanium and a few other metals are capable of withstanding chemical attack from it.

Freshly prepared aqua regia is colorless, but it turns orange within seconds. Here, fresh aqua regia has been added to these NMR tubes to remove all traces of organic material.

Contents

Applications



Freshly prepared aqua regia to remove metal salt deposits.

Aqua regia is primarily used to produce chloroauric acid, the electrolyte in the Wohlwill process. This process is used for refining highest quality (99.999%) gold. (See dissolving gold)

Aqua regia is also used in etching and in specific analytic procedures.
It is also used in some laboratories to clean glassware of organic compounds and metal particles. This method is preferred over the "traditional" chromic acid bath for cleaning NMR tubes, because no traces of paramagnetic chromium can remain to later spoil acquired spectra.[1] Furthermore, chromic acid baths are discouraged because of the high toxicity of chromium and the potential for explosions. Aqua regia is itself very corrosive and has been implicated in several explosions due to mishandling.[2]

Due to the reaction between its components resulting in its decomposition, aqua regia quickly loses its effectiveness. As such, its components should only be mixed immediately before use. While local regulations may vary, aqua regia may be disposed of by carefully neutralizing with an appropriate agent—such as sodium bicarbonate—before pouring down the sink. If there is a large amount of metal in solution with the acid, it may be preferable to carefully neutralize it, and absorb the solution with a solid material such as vermiculite before discarding it with solid waste.

HACKH'S
CHEMICAL DICTIONARY

[American and British Usage]

Containing the Words Generally Used in Chemistry, and Many of the Terms Used in the Related Sciences of Physics, Astrophysics, Mineralogy, Pharmacy, Agriculture, Biology, Medicine, Engineering, etc.

Based on Recent Chemical Literature

FOURTH EDITION

Completely Revised and Edited by

JULIUS GRANT

M.SC., PH.D., F.R.I.C. CHEMICAL CONSULTANT

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apple acid. Malic acid. **a. oil.** Amyl valerate.
Appleton, Sir Edward Victor. 1893–1965. British scientist, Nobel Prize winner (1947); established the existence of the Heaviside layer. **A. layer.** An ionized layer in the atmosphere which reflects downward any short radio waves that have penetrated the Heaviside layer below it.
applicator. A device for the local administration of a remedy; e.g., a radium applicator.
Approved Name. A short name selected for a drug by the British Pharmacopoeia Commission with the intent that if the drug is eventually included in the Pharmacopoeia, the A.N. shall be its official title. A.N. do not conflict with registered trademarks. Cf. *U.S. Adopted Names*.
approximate. Near; not exact.
aprotic. Not yielding or accepting a proton. **a. substance.** One which acts as neither an acid nor a base. Cf. *acid. base*.
apyonin. Auramine.
apyron. Lithium acetyl salicylate.
aq. Abbreviation for aqueous.
aqua. Water (Latin). Cf. *aquo*. Denotes: (1) water, (2) an aqueous solution or infusion, (3) in formulas (+*aqua*) a variable amount of water, (4) water of crystallization. **a. anethyl.** See *dill* water. **a. carui.** See *caraway* water. **a. compound.** Hydrate. **a. destillata.** Distilled *water*. **a. fervens.** Hot water. **a. fluvialis.** River water. **a. fontana.** Spring or well water. **a. fortis.** Nitric acid. **a. laurocerasi.** *Cherry laurel* water. **a. marina.** Sea water. **a. nivialis.** Snow water. **a. pluvialis.** Rainwater. **a. pura.** Pure water. **a. regia.** A mixture of 3 pts. HCl and 1 pt. HNO_3. A solvent for noble metals. **a. tepida.** Warm water. **a. vitae.** Brandy or whisky.
Aquadag. Trademark for a colloidal suspension of graphite in water; a lubricant and an electrically conductive coating.
aquamarine. A sea-green beryl.
aquation. The formation of aquo ions. Cf. *hydration, solvation*.
aquatone. A printing process similar to collotype.
aqueous. Watery. **a. solution.** A solution with water as solvent.
aquifer. A subterranean water-bearing formation.
aquinite. Chloropicrin.
aquo. Pertaining to water. **a. ions.** Complex ions which contain several molecules of water; as, $[M(H_2O)_8]^{++}$, where M is a divalent metal. Cf. *hydration, ammonia system, hydrogen ion, base*.
A.R. Abbreviation for analytical reagent.
Ar. Symbol for argon.
ar- Prefix indicating substitution in the *aromatic* nucleus. Cf. *ac-*.
araban. $(C_5H_{10}O_5)n = 150.11n$. An arabinose polysaccharide in the mucilage of Malvaceae.
arabate. A salt of arabic acid.
arabic acid. $C_5H_{10}O_6 \cdot H_2O = 184.2$. Arabitic acid, d-tetrahydroxyvaleric acid. White powder precipitated from gum arabic solution by alcohol; soluble in water.
arabin. $C_{10}H_{18}O_9 = 282.19$. Amorphous powder, soluble in water, from gums. **a. water.** A solution of the water-soluble constituents of gums in hydnocarpus oil.
arabinogalactan. An adhesive obtained by leaching larch wood.
arabinose. $CHO_2(CHOH)_3 \cdot CH_2OH = 150.11$. Pectin sugar, pectinose, gum sugar. The pentoses obtained by hydrolysis of acacia. **d-** White rhombs, m.160, soluble in water; a culture medium for certain bacteria.
arabinulose. $C_5H_{10}O_5 = 150.11$. The ketopentose corresponding with arabinose.
arabite. Arabitol.
arabitic acid. Arabic acid.
arabitol. $CH_2OH \cdot (CHOH)_3 \cdot CH_2OH = 152.13$. Arabite. An alcohol derived from arabinose. Colorless, sweet *d*- and *l*-form crystals, m.102, soluble in water.
arabonic acid. $CH_2OH \cdot (CHOH)_3 \cdot COOH = 166.11$. A hydroxy acid, derived from arabinose. Colorless crystals, m.89, soluble in water.
Araceae. Aroideae.
arachic acid. $Me(CH_2)_{18}COOH = 312.42$. Arachidic acid, eicosanoic acid*, *n*-eicosoic acid. White leaflets, m.77.5, insoluble in water; a constituent of butter.
arachidic acid. Arachic acid. **a. alcohol.** Eicosyl alcohol.
arachidonic acid. $C_{20}H_{32}O_2 = 304.25$. A liquid. unsaturated acid, b.245, in lard and mammal fat.
arachin. A globulin from peanuts (24%), *Arachis hypogoea*. Contains chiefly arginine and glutamic acid with other amino acids; a source of Ardil, q.v,
arachis. See *peanuts*. **a. oil.** Peanut oil, groundnut oil. A fixed oil from peanuts, $d_{25°}0.913$. World production (1964) 3 million tons. See *Bellier's test*.
arachnidism. Poisoning from the bite of the black widow spider, *Latrodectus mactans*.
arachnolysin. A hemolytic principle of spider poison.
arack. Arrack.
araeometer. Areometer. See *hydrometer*.
aragonite. $CaCO_3$. Pisolite. Needle spar. A native calcium carbonate. Cf. *calcite*.
Aralac. Trade name for a fibrous product made from skim milk casein. Cf. *lanital*.
Araldite. Trademark for an epoxy resin, used for adhesives, lamination, and surface coatings and castings.
aralia. Nard, American spikenard. The dried rhizomes and roots of *A. racemosa* (Araliaceae); an alterative and diaphoretic.
Araliaceae. Aromatic plants which yield: *Panax quinquefolium* (ginseng), *Aralia nudicaulis* (false sarsaparilla), *Aralia racemosa* (American spikenard), *Aralia hispida* (dwarf elder).
aralin. A glucoside from the fresh leaves of *Aralia* species.
aralkyl. Arylated alkyl. A radical in which an alkyl H atom is substituted by an aryl group. Cf. *alphyl*.
aranein. A homeopathic liquid from spider abdomens.
araphite. A magnetic basalt from Colorado.
araroba. *Goa* powder.
Arasan. Trademark for tetramethyl thiuram disulfide; a seed disinfectant.
arbacin. A protein in the sperm of the sea urchin (*Arbacia*).
arbor. Official Latin for tree. **a. Dianae.** Silver tree. Arborescent silver formed on adding mercury to a silver salt solution. **a. Saturni.**